DATE: February 10, 1997

TO: Office of Water Programs Engineers and Inspectors

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SUBJECT: Water - Procedure - Sample Collection/Analysis - Raw Groundwater MPN Sampling

Delete: WM 780

Changes Made to WM780

Section II - added "Tao Le of" and "at (804)786-7715" to the second sentence second paragraph.

Section IIIA3c - removed "both" and "and fecal" from the first sentence.

Section IV - revision from DCLS incorporated.

I. Introduction

The Virginia Department of Health-Office of Water Programs (VDH-OWP) has decided to reinstate, in the interest of public health, collection of data on certain raw groundwater sources. 12 VAC 5-590-360, Reliability and Responsibility for Conditions in the Waterworks, of the Virginia *Waterworks Regulations* states in part "...this shall include specific and continuing assessment of the capability, effectiveness, and reliability of the treatment process in relation to potential contaminants in the source of supply." This section allows us the discretion to ask for raw groundwater MPN sampling. Outlined below are the procedures to be used for existing sources and new sources.

II. Existing Sources

Existing groundwater sources will be grouped as a (1) karstian well (2) non-karstian well or (3) spring. Karstian wells will need one quarterly raw water MPN sample and non-karstian wells will need one raw water MPN sample per year. Springs will need a monthly raw water MPN sample. These sampling requirements only apply to sources which chlorinate or provide some other treatment that may alter or affect bacteriological quality prior to the approved bacteriological sampling locations. Groundwater sources without chlorination or treatment as described above do not need to collect any additional samples.

District Engineers will notify owners of this requirement and use their judgment as to what systems provide treatment as described above. District Engineers will also coordinate sample container distribution and scheduling of samples with Tao Le of DCLS at (804)786-7715. The *Waterworks Regulations* requires the owner to be responsible for required sampling; however, district staff may provide whatever technical assistance is necessary, including collection of MPN raw water samples. Enforcement will be a low priority, i.e., addressed primarily in addition to other violations.

However, failure to comply in the future may lead to additional requirements via the treatment technique provisions. Owners should be encouraged to do some of the sampling within 72 hours of rainfall event to get the best information relative to potential surface water influence. District Engineers may use their discretion in determining whether to collect samples for the owner, what constitutes a rainfall event and whether to decrease the suggested time period for sampling after a rainfall event.

III. New Sources

For new wells, we must determine surface water influence. VDH-OWP will continue to use well log, pump test, chemical and bacteriological data to make an initial determination.

A. Karstian wells need additional MPN sampling for 12 months to better access long-term possible surface water influence. One sample/month plus additional samples collected after eight rainfall events will be required. District Engineers can compress the sampling schedule to two samples/month for six months plus eight rainfall events if desired. Upon completion of the initial 12 month (or six months) sampling period, new wells in karstian geology will revert to quarterly monitoring as described in II.

Some localities have expressed an interest in sampling for surface water influence at the time of well development. Therefore, the LFO has worked with a consulting firm to develop the following protocol designed to make an accurate and early determination of surface influence for a karstian well.

1. A well site inspection will be conducted as usual; however, the well site approval letter will stipulate that the water well completion report will be submitted for evaluation upon completion of the well.

2. Upon receipt, the well log will be evaluated to help determine the well's potential for surface influence based on parent material and geological structure (i.e., site located in karstian or non-karstian geology--is site underlain with limestone or dolomite, does it pass through caverns, etc.). Based on this evaluation, the owner will be advised of yield and drawdown test requirements and provided with a list of developmental sampling requirements.

3. If the well is determined to be located in karstian geology, the following development procedure will be used to determine surface influence:

    a. Water quality monitoring (inorganic, organic, volatile organic, metals, radiological) will be conducted during the yield and drawdown test. Well(s) will be pumped continuously at maximum pumping rate for a minimum duration of five (5) days. The pump rate should be sustained at a constant rate during the last 48 hours for yield determination.

    b. Well pump discharge and suction lines will be chlorinated prior to pumping. No chlorine is to be present during the five (5) day pump test.

    c. Bacteriological testing will be conducted for total coliform using the multiple-portion decimal-dilution (MPN) method. A total of twenty (20) samples each should be collected from the pump discharge at 6 hour intervals during the five (5) day yield and drawdown test.

    d. Turbidity, temperature, pH and conductivity measurements will be required at 6 hour intervals during the five (5) day test period. These samples will also be collected from the pump discharge.

e. A Microscopic Particulate Analysis (MPA) will be performed on samples collected during the final 24 hours of the yield and drawdown test.

4. The source will be deemed to be surface influenced, only if:

a. Source is found to have confirmed fecal contamination, or

b. The results of the total coliform MPN testing indicates that more than 10% of the samples exceed 100 organisms/100 ml., or

c. MPA results indicate the presence of rotifers, diatoms, coccidia, plant debris, insect parts, or Giardia cysts in the source water.

5. If deemed to be surface influenced, the owner will be notified in writing of same and advised that filtration must be provided in order for the wall to be utilized.

6. The procedure outlined in Paragraph 3 above is not cast in concrete and the owner/developer may propose an alternate method to determine surface influence. Any proposed alternative should address this determination in a logical manner and meet the intent of 12 VAC 5-590-430 of the *Waterworks Regulations*. Concurrence of Technical Services, DWSE will be needed prior to the implementation of any proposed alternative evaluation method.

B. Non-karstian wells can continue to be evaluated solely by the development samples followed by the yearly sample described in II.

C. New springs will be required to conduct raw water MPN sampling prior to being placed into service. The 12 monthly samples plus additional samples after eight rainfall events (or compressed six month schedule) will generally be required. District Engineers can modify the sample schedule to take into consideration any previous and properly done MPN sample results.

IV. Microbiological Testing Methods

The recommended method for monitoring raw groundwater sources is the 15 tube version of the Multiple Tube Fermentation Technique for Total Coliform. To set up a 15 tube test, inoculate one five tube row of double strength Lauryl Tryptose Broth (LTB) with 10 ml of sample per tube, inoculate one five tube row of single strength LTB with 1 ml of sample per tube and inoculate one five tube row of double strength LTB with 10 ml of a 1:100 dilution of sample per tube. After incubation, transfer growth from each positive tube into individual tubes of Brilliant Green Lactose Bile Broth (BGLBB) to confirm for total coliform and incubate. See page 9-50 of the 18th Edition of Standard Methods for the Examination of Water and Wastewater to calculate the MPN value from the number of positive BGLBB tubes from the MPN Index. Also, see pages 9-45 and 9-46 for a description of this method.

These samples are not compliance samples and waterworks do not have to use a Virginia certified laboratory to perform the 15 tube Fermentation Technique. Please call Eileen Q. Sanders, Certification Officer, at (804) 371-2871 with any questions about the test method.